

Ephemerides of the Satellites of Mars during the Oppositions of 1888 and 1890. By J. Morrison, M.D., M.A., Ph.D., Assistant on the American Ephemeris, and Professor of Chemistry, National University, Washington.

These ephemerides have been computed from the following elements of the orbits of the satellites, referred to the equator and equinox of the respective epochs:—

Phobos.

Epochs	1888, April 11 ^o	1890, May 27 ^o Greenwich M.T.
Period	^d 0 ^o 3189113 (mean solar)	
μ	1128 ^o 8405	
a	12 ^{''} 953 (at distance unity)	
i	36 ^o 44'6	36 ^o 44'0
N	47 18.2	47 19.0
u	17 40	117 53.6

Deimos.

Epochs	1888, April 11 ^o	1890, May 27 ^o Greenwich M.T.
Period	^d 1 ^o 262435 (mean solar)	
μ	285 ^o 16322	
a	32 ^{''} 354 (at distance unity)	
i	35 ^o 36'	35 ^o 35.5'
N	48 10.66	48 11.5
u	225 41	172 21.5

Greenwich Mean Time of Greatest Elongation.

Phobos.

G.M.T.				p	a	b	G.M.T.				p	a	b
1888. d	h	m					1888. d	h	m				
Mar. 21	7	53.5	W	306 ^o 4	19 ^{''} 1	6 ^{''} 1	Mar. 30	6	8.5	W	°	"	"
22	10	40.4	E				31	8	55.3	E			
23	13	27.3	W				Apr. 1	11	42.1	W	305.8	20.5	6.8
24	16	14.2	E				2	14	29.0	E			
25	19	1.1	W				3	17	15.8	W			
26	21	48.0	E	126.2	19.6	6.4	4	20	2.6	E			
28	0	34.8	W				5	22	49.4	W			
29	3	21.7	E				7	1	36.1	E	125.3	21.0	7.3

Phobos.

G.M.T.							G.M.T.								
1890.	d	h	m		<i>p</i>	<i>a</i>	<i>b</i>	1890.	d	h	m		<i>p</i>	<i>a</i>	<i>b</i>
May	8	0	44.8	E	123.6	23.5	2.3	June	7	3	52.1	W			
	9	3	31.8	W					8	6	39.0	E			
	10	6	18.8	E					9	9	26.0	W			
	11	9	5.8	W					10	12	12.9	E	126.7	26.5	5.3
	12	11	52.8	E					11	14	59.9	W			
	13	14	39.8	W	304.1	25.0	3.0		12	17	46.8	E			
	14	17	26.8	E					13	20	33.8	W			
	15	20	13.8	W					14	23	20.8	E			
	16	23	0.8	E					16	2	7.7	W	307.1	26.0	5.6
	18	1	47.8	W					17	4	54.8	E			
	19	4	34.7	E	124.5	25.4	3.3		18	7	41.7	W			
	20	7	21.7	W					19	10	28.9	E			
	21	10	8.6	E					20	13	16.0	W			
	22	12	55.6	W					21	16	3.2	E	127.3	25.5	5.7
	23	15	42.5	E					22	18	50.2	W			
	24	18	29.5	W	305.0	26.0	3.8		23	21	37.4	E			
	25	21	16.4	E					25	0	24.6	W			
	27	0	3.3	W					26	3	11.9	E			
	28	2	50.2	E					27	5	59.2	W	307.5	24.9	5.7
	29	5	37.0	W					28	8	46.4	E			
	30	8	23.9	E	125.6	26.3	4.3		29	11	33.7	W			
	31	11	10.8	W					30	14	21.0	E			
June	1	13	57.6	E				July	1	17	8.3	W			
	2	16	44.6	W					2	19	55.6	E	127.7	24.1	5.7
	3	19	31.4	E					3	22	42.9	W			
	4	22	18.4	W	306.1	26.7	4.8		5	1	30.2	E			
	6	1	5.2	E					6	4	17.6	W			

Deimos.

G.M.T.				<i>p</i>	<i>a</i>	<i>b</i>	G.M.T.				<i>p</i>	<i>a</i>	<i>b</i>		
1890.	d	h	m				1890.	d	h	m					
Apr.	30	22	40.9	E	122.5	55.1	5.6	May	16	2	3.6	E			
May	2	20	6.9	W					17	23	28.0	W			
	4	17	32.7	E					19	20	52.3	E	124.0	63.7	9.4
	6	14	58.3	W					21	18	16.6	W			
	8	12	23.6	E					23	15	40.9	E			
	10	9	48.9	W	303.1	59.7	7.2		25	13	5.1	W			
	12	7	14.0	E					27	10	29.1	E			
	14	4	38.9	W					29	7	53.1	W	304.9	66.1	11.8

G.M.T.			<i>p</i>	<i>a</i>	<i>b</i>	G.M.T.			<i>p</i>	<i>a</i>	<i>b</i>
1890. d	h	m	°	"	"	1890. d	h	m	°	"	"
May 31	5	17.1	E			June 19	3	21.4	E		
June 2	2	41.1	W			21	0	46.7	W		
4	0	5.3	E			22	22	12.3	E		
5	21	29.4	W			24	19	38.1	W		
7	18	53.6	E	125.6	66.6 13.8	26	17	4.1	E	126.5	62.1 15.2
9	16	17.9	W			28	14	30.3	W		
11	13	42.4	E			30	11	56.6	E		
13	11	6.9	W			July 2	9	23.1	W		
15	8	31.5	E			4	6	49.8	E		
17	5	56.3	W	306.1	65.6 14.8	6	4	16.8	W	306.6	57.6 14.5

In these ephemerides *p* denotes the position-angle of the major axis of the satellite's apparent orbit, and is reckoned from the north towards the east, and from 0° to 360°; *a* and *b* denote the major and minor semi-axes of the apparent orbit. During these two oppositions of the planet the satellites move in the direction of *increasing* position-angles, the Earth being *above* the plane of the orbits. The time of greatest elongation has been given to the nearest tenth of a minute in order that a sufficiently accurate comparison may be had with observation.